Improved overflow system.

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Abstract of **EP0333251**

To reduce energy wastage due to premature loss of hot rinse water in a mechanical warewashing machine (1) for sequential washing of a series of loads, each being subjected to a wash cycle in which it is doused (23, 25) with a wash liquor from a liquid delivery system (15, 17), the liquor being collected in a tank (7) disposed below the load (9, 11) and then, to a rinse cycle in which it is doused with rinse water which falls into the wash liquor already in the tank, the rank being provided with an overflow pipe (35) for limiting the liquid level (36) therein, the overflow pipe is provided with a siphon portion having a first opening (47, 55) disposed so as to be essentially below said liquid level and a second smaller opening (48, 56) above the liquid level so as to equalise the pressure at the top of the overflow pipe and above the liquid in order to prevent a siphonic action, thereby causing substantial mixing of the rinse water with the wash liquor before any of the water exits through the overflow pipe.

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(54) Improved overflow system.

(57) To reduce energy wastage due to premature loss of hot rinse water in a mechanical warewashing machine (1) for sequential washing of a series of loads, each being subjected to a wash cycle in which it is doused (23, 25) with a wash liquor from a liquid delivery system (15, 17), the liquor being collected in a tank (7) disposed below the load (9, 11) and then, to a rinse cycle in which it is doused with rinse water which falls into the wash liquor already in the tank, the rank being provided with an overflow pipe (35) for limiting the liquid level (36) therein, the overflow pipe is provided with a siphon portion having a first opening (47, 55) disposed so as to be essentially below said liquid level and a second smaller opening (48, 56) above the liquid level so as to equalise the pressure at the top of the overflow pipe and above the liquid in order to prevent a siphonic action, thereby causing substantial mixing of the rinse water with the wash liquor before any of the water exits through the overflow pipe.

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IMPROVED OVERFLOW SYSTEM

The present invention relates to a mechanical warewashing machine for sequential washing of a series of loads, each being subjected to a wash cycle in which it is doused with a wash liquor from a liquid delivery system, the liquor being collected in a tank disposed below the load and then, to a rinse cycle in which it is doused with rinse water which falls into the wash liquor already in the tank, the tank being provided with an overflow pipe for limiting the liquid level therein.

In such machines, the total volume of the wash liquor is normally much larger than that of the hot rinse water. Conventionally, the overflow pipe is a vertical tube extending through the base of the tank, ending in an upwardly disposed opening. The liquid in the tank assumes the height of this opening.

After each wash cycle, the wash liquor is stored in the tank waiting to be recycled for washing the next load. Some of the liquor remains in a recirculation unit for forming part of the delivery system. Each cycle, the detergency power of the liquor is reduced, first because some is exhausted in removing soil and second, because it is partially diluted when the rinse water falls into it. This is not too critical because when the liquor is recirculated, it is recharged with an alkaline and/or surfactant based cleaning agent from a dosing system of known kind.

However, it will be appreciated that soil removed from the load falls into the tank with the applied liquor. After a number of loads has been washed, the build-up of soil in the tank means that the liquor is too contaminated for further use and must be replaced, which is wasteful of cleaning agent, energy and time. The rinse water falling into the tank does wash some of the soil down the overflow but as it falls onto the liquor surface, there is a tendency for it to be lost immediately down the overflow without substantially mixing with the body of the liquor. Thus, not much soil is removed and the time before total replacement of the liquor becomes necessary is not optimally increased.

There is also a subsidiary disadvantage with the system, because of necessity, the rinse water is fairly hot (typically around 85° C). The wash liquor already held in the tank awaiting recycling, has to be kept at the desired temperature (normally about 55° C-60° C) by thermostated heating. Clearly, when the hot rinse water falls into the liquor, its total heat content ought to contribute to the temperature of the wash liquor, resulting in some saving of energy consumed by the thermostated heater. However, much of the valuable energy content of the rinse water is lost when it is immediately drained-off via the overflow.

We have now found that these disadvantages can be overcome if the overflow pipe is provided with a siphon portion having a first opening disposed so as to be essentially below said liquid level and a second smaller opening above the liquid level so as to equalise the pressure at the top of the overflow pipe and above the liquid in order to prevent a siphonic action, thereby causing substantial mixing of the rinse water with the wash liquor before any of the water exits through the overflow pipe.

It is known to provide a fabric washing machine with a siphon tube draining from the centre of a rotating drum, according to DE 2 241 329. It is also known to provide a machine dishwasher with a liquid level control comprising an overflow pipe with siphon, connected to a chamber wherein the pressure triggers a pressostat, such as described in EP 152 893 and EP 253 655. It is also known to provide a liquid dosing dispenser for a fabric washing machine, with a siphon outlet tube having its open end at the base of the dispenser chamber (US 2991911). Various auxiliary devices for washing machines comprising a water level regulator provided with an overflow pipe and overcap tube for siphonic action are described in specifications EP 003 451, GB 1 510 750, EP 128 070 and DE 3 215 501. However it is believed that the siphon overflow according to the present invention has never been utilised in the tank of the aforementioned kind of mechanical warewashing machine, in order to provide more efficient operation and a simple, cheap and effective energy saving means.

In one preferred embodiment of the invention, the first opening in the siphon portion is located near the bottom of the tank. Preferably, the siphon portion of the overflow pipe comprises an inverted U-shaped bend in the top thereof.

In an alternative especially preferred embodiment, the siphon portion comprises a cap disposed over an upwardly facing open end in the overflow pipe.

The present invention will now be better explained by way of the following specific descriptions in which:

Figure 1 illustrates a mechanical warewashing machine of a known kind, with the known form of overflow pipe.

Figure 2 illustrates one preferred overflow pipe according to the present invention, to be used in the machine depicted in Figure 1.

Figure 3 illustrates an especially preferred overflow pipe according to the present invention, again for use in the machine shown in Figure 1.

Figure 1 shows a known kind of mechanical warewashing machine 1, comprising a chamber 3, divided into a washing space 5 and a tank 7 situated thereabove. In use, a load 9, comprising for example, dishes 11, is disposed in a rack 13 supported within in washing space.

A liquid delivery system comprising freely rotatable spray arms 15, 17 respectively disposed above and below the load, is supplied with wash liquor through ports 19, 21 respectively. The liquid in question is used to douse the load by being delivered in the form of jets 23, 25, which exit through nozzles 27, 29 in the spray arms. As is conventional, the nozzles are angled so that the jets cause the spray arms to rotate (arrows A,B).

When the load has been inserted, a first wash cycle is begun, in which a large volume of warm wash liquor is used to douse the load. This liquor then drips (31) into the tank and is repeatedly recirculated during the wash cycle by pump 32 and via a reciculation system (not shown). The volume of the body of wash liquor 33 held in the tank is limited by an overflow pipe 35. When the liquid level 36 reaches the height of the open end 37 of the overflow, any excess flows to drain in the direction of arrow C. Typically, the volume of the tank is about 50 litres.

After the wash cycle, the load is doused with about 3 litres of very hot water (about 85°C), delivered from the mains via a heating system (not shown). The rinse water enters through annular ports 38, 39 concentric with ports 19, 21 respectively. It is applied to the load from spray arms 41, 42 which are substantially identical to arms 25, 17 and are also freely rotatable in the direction of arrows A, B. Like the wash liquor, the rinse water also drips into the tank, to join the liquor already held there.

In practice, because the open end of the overflow pipe is upwardly facing, the rinse water tends to disappear straight down the overflow pipe without thoroughly mixing with the liquor in the tank. Moreover, the higher temperature of the rinse water and therefore its lower density also tends to prevent its mixing with the bulk of the wash liquor.

Since the liquor is being held in the wash tank for reuse later, it is kept warm by means of a thermostated heater (not shown). The very high temperature of the rinse water, means that despite its relatively small volume, if it could thoroughly mix with the bulk of liquor in the tank, then it would make a significant contribution to the heat content thereof, and so reduce the amount of energy which has to be consumed by the thermostated heater. However, as stated, in practice much of the rinse water is lost immediately. This is the problem which the present invention overcomes.

After the rinse cycle, the washed load is replaced by a new soiled one, and the whole process is repeated again. In this subsequent cycle, the wash liquor is drawn from the tank (through filter 43), by the pump. It is delivered outwardly in the direction of arrow D, via a conventional dosing unit (not shown), within the recirculation system, where it is recharged with cleaning agent and is recycled to the delivery system (spray arms 15, 17).This next wash cycle then proceeds in like manner to the first. Then, another rinse cycle is executed, and again the liquor in the tank is further diluted by a small amount. This process is repeated until the wash liquor is so contaminated by soil build-up, that it is not so longer useful for practical purposes.

Turning now to Figure 2, the invention in one embodiment provides an alternative overflow pipe 44, to be used in place of the known pipe 35 in the machine of Figure 1. In this case however this new overflow pipe is provided with an inverted U-shaped bend 45 in its upper region.

In use, the liquid level in the tank will rise until it reaches the upper most portion 46 of the bend. The liquid can thereby freely enter the downward facing part of the overflow pipe through the first opening 47. Any additional water falling onto the surface of the liquid in the tank will cause some of the liquid to flow down the overflow pipe. The second smaller opening 48 which is located at the top of the U-shaped bend of the overflow pipe is a small air venting hole. It thereby acts to prevent the build-up of pressure differences between the inside of the overflow pipe and the liquid level. Such pressure differences might otherwise cause the tank to exhibit a siphonic action, i.e. to empty itself down the overflow pipe until the liquid level has dropped to the level of the first opening 47. Since the opening 47 is located permanently below the surface of the liquid in the tank, the water falling onto the wash liquor must have undertaken substantial mixing with the bulk of the liquid before any is lost down the overflow. This means in practice that more soil from the tank is washed away down the overflow in each rinse cycle, so that more wash/rinse operations can be executed before the liquor in the tank has to be renewed completely. Also, more of the heat of the rinse water is conserved, resulting in a significant energy saving.

In a second especially preferred embodiment shown in Figure 3, another overflow pipe 49 is provided with an upwardly facing open end 51 over which is disposed a cylindrical cap 53 so that the cap and pipe together define an annular first opening 55.In the top of the cap there is provided a second smaller opening 56. It will be immediately apparent that the operation of this device is analogous to that described in relation to Figure 2.

Claims

1. A mechanical warewashing machine (1) for sequential washing of a series of loads, each being subjected to a wash cycle in which it is doused (23, 25) with a wash liquor from a liquid delivery system (15, 17), the liquor being collected in a tank (7) disposed below the load (9, 11) and then, to a rinse cycle in which it is doused with rinse water which falls into the wash liquor already in the tank, the rank being provided with an overflow pipe (35) for limiting the liquid level (36) therein, characterised in that the overflow pipe is provided with a siphon portion having a first opening (47, 55) disposed so as to be essentially below said liquid level and a second smaller opening (48, 56) above the liquid level so as to equalise the pressure at the top of the overflow pipe and above the liquid in order to prevent a siphonic action, thereby causing substantial mixing of the rinse water with the wash liquor before any of the water exits through the overflow pipe.

2. Machine according to claim 1, further characterised in that the first opening in the siphon portion is located near the bottom of the tank.

3. A machine according to claim 1-2, further characterised in that the siphon portion comprises an inverted U-shaped bend (45) in the overflow pipe.

4. A machine according to claim 1-2, further characterised in that the siphon portion comprises a cap (53) disposed over an upwardly facing open end in said overflow pipe.

Fig.1.

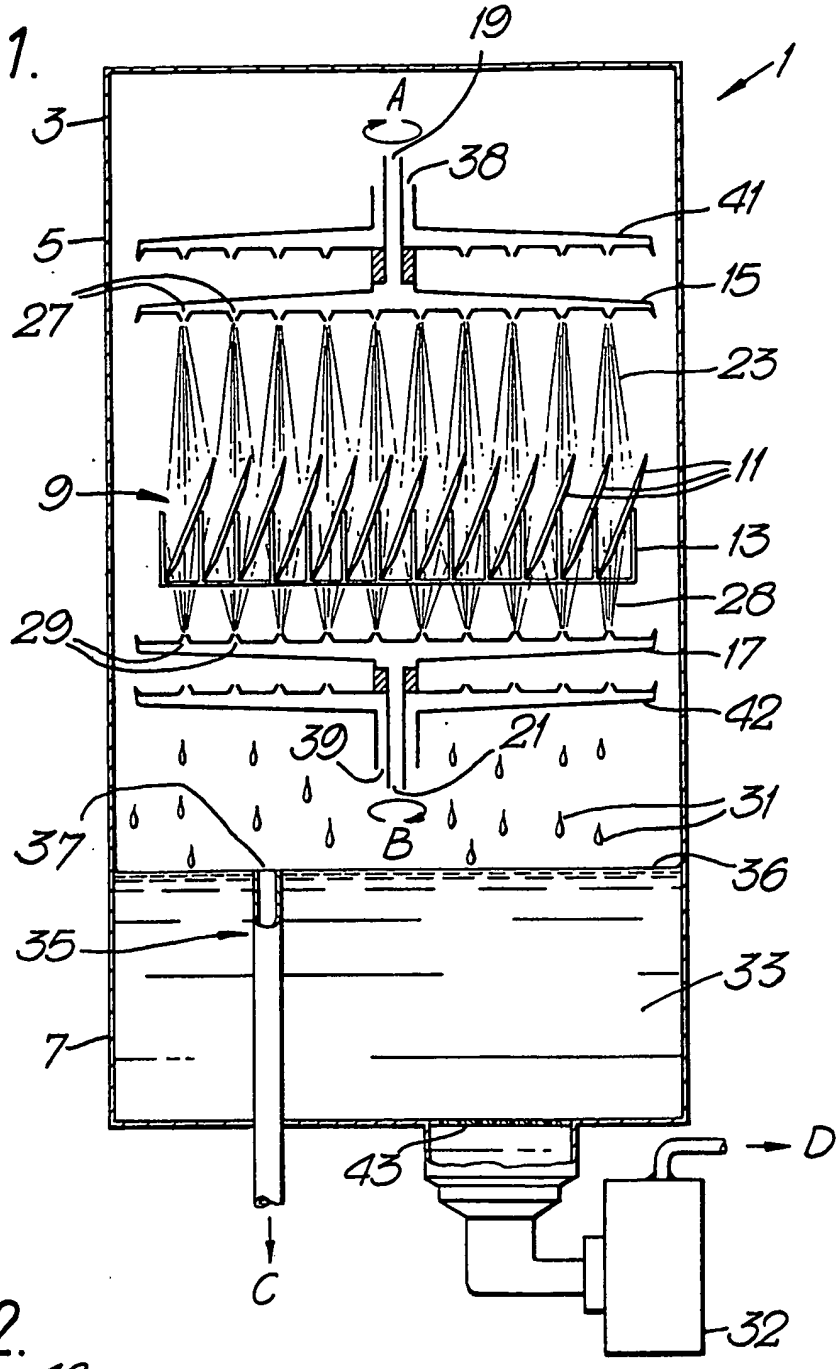

Fig.2.

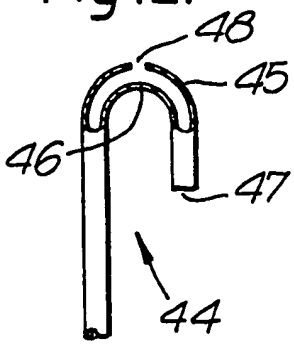

Fig.3.